

## CLAIMS

1. A process for producing at least one protic ammonium tetrakis(<sup>F</sup>aryl)borate, which process comprises
  - i) mixing together (a) at least one alkali metal tetrakis(<sup>F</sup>aryl)borate, at least one magnesium tetrakis(<sup>F</sup>aryl)borate, at least one halomagnesium tetrakis(<sup>F</sup>aryl)borate, or a mixture of two or more of the foregoing, (b) at least one amine, wherein the amine has the formula R<sub>3</sub>N, in which each R is independently a hydrocarbyl group containing up to about thirty carbon atoms, and (c) one or more liquid dihydrocarbyl ethers, one or more liquid hydrocarbons, one or more liquid halogenated hydrocarbons, or a mixture of two or more of the foregoing, to form a solution or slurry in a liquid organic medium; and
  - ii) mixing together at least one protic acid with at least a portion of the solution or slurry formed in i), such that a protic ammonium tetrakis(<sup>F</sup>aryl)borate is formed,wherein each of the <sup>F</sup>aryl groups is a fluorine-containing aryl group that has bonded directly to an aromatic ring at least two fluorine atoms, or at least two perfluorohydrocarbyl groups, or at least one fluorine atom and at least one perfluorohydrocarbyl group.
2. A process according to Claim 1 wherein (a) is an alkali metal tetrakis(<sup>F</sup>aryl)borate, and wherein said alkali metal tetrakis(<sup>F</sup>aryl)borate is solvent-wet.
3. A process according to Claim 1 wherein said alkali metal tetrakis(<sup>F</sup>aryl)borate is a sodium or potassium tetrakis(<sup>F</sup>aryl)borate.
4. A process according to Claim 2 wherein said alkali metal tetrakis(<sup>F</sup>aryl)borate is a sodium or potassium tetrakis(<sup>F</sup>aryl)borate.
5. A process according to Claim 1 wherein each position on the aromatic ring(s) of the <sup>F</sup>aryl group that is not a fluorine atom or a perfluorohydrocarbyl group is substituted by a hydrogen atom, a hydrocarbyl group, an alkoxy group, or a silyl group.
6. A process according to Claim 1 wherein the aromatic ring of said <sup>F</sup>aryl group is a phenyl ring.
7. A process according to Claim 1 wherein all of the positions on said aromatic ring(s) of said aryl group are substituted by fluorine atoms.
8. A process according to Claim 6 wherein the tetrakis(<sup>F</sup>aryl)borate is tetrakis(pentafluorophenyl)borate.
9. A process according to Claim 1 wherein the alkali metal tetrakis(<sup>F</sup>aryl)borate is sodium tetrakis(pentafluorophenyl)borate or potassium tetrakis(pentafluorophenyl)borate.

10. A process according to Claim 2 wherein the alkali metal tetrakis(<sup>F</sup>aryl)borate is sodium tetrakis(pentafluorophenyl)borate or potassium tetrakis(pentafluorophenyl)borate.
11. A process according to Claim 1 wherein at least one R group of said amine is a phenyl group.
12. A process according to Claim 1 wherein at least one R group of said amine is a methyl group.
13. A process according to Claim 1 wherein the amine is phenyl(dimethyl)amine.
14. A process according to Claim 1 wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers.
15. A process according to Claim 14 wherein the liquid dihydrocarbyl ether is diethyl ether.
16. A process according to Claim 1 wherein the alkali metal tetrakis(<sup>F</sup>aryl)borate is sodium tetrakis(pentafluorophenyl)borate or potassium tetrakis(pentafluorophenyl)borate, wherein the amine is phenyl(dimethyl)amine wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers, and wherein said liquid dihydrocarbyl ether is diethyl ether.
17. A process according to Claim 16 wherein said alkali metal tetrakis(<sup>F</sup>aryl)borate is solvent-wet.
18. A process according to Claim 1 wherein (a) is a magnesium di[tetrakis(<sup>F</sup>aryl)borate].
19. A process according to Claim 18 wherein said magnesium di[tetrakis(<sup>F</sup>aryl)borate] is magnesium di[tetrakis(pentafluorophenyl)borate].
20. A process according to Claim 18 wherein said magnesium di[tetrakis(<sup>F</sup>aryl)borate] is magnesium di[tetrakis(pentafluorophenyl)borate], wherein the amine is phenyl(dimethyl)amine, wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers, and wherein said liquid dihydrocarbyl ether is diethyl ether.
21. A process according to Claim 1 wherein (a) is a halomagnesium tetrakis(<sup>F</sup>aryl)borate.
22. A process according to Claim 21 wherein said halomagnesium tetrakis(<sup>F</sup>aryl)borate is bromomagnesium tetrakis(pentafluorophenyl)borate.
23. A process according to Claim 21 wherein said halomagnesium tetrakis(<sup>F</sup>aryl)borate is bromomagnesium tetrakis(pentafluorophenyl)borate, wherein the amine is

phenyl(dimethyl)amine, wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers, and wherein said liquid dihydrocarbyl ether is diethyl ether.

24. A process according to Claim 1 wherein said protic acid is hydrochloric acid, hydrobromic acid, or hydroiodic acid.

25. A process according to Claim 24 wherein said acid is in diethyl ether.

26. A process according to Claim 1 wherein said acid is in aqueous solution.

27. A process according to Claim 26 wherein the acid is hydrochloric acid, hydrobromic acid, or hydroiodic acid.

28. A process according to Claim 26 wherein the concentration of the acid in solution is in the range of about 0.5 wt% to about 12 wt%.

29. A process according to Claim 1 wherein the amine is phenyl(dimethyl)amine, and wherein the protic acid is hydrochloric acid, hydrobromic acid, or hydroiodic acid.

30. A process according to Claim 1 wherein the alkali metal tetrakis(<sup>F</sup>aryl)borate is sodium tetrakis(pentafluorophenyl)borate or potassium tetrakis(pentafluorophenyl)borate, wherein the amine is phenyl(dimethyl)amine, wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers, and wherein the protic acid is hydrochloric acid, hydrobromic acid, or hydroiodic acid.

31. A process according to Claim 30 wherein said sodium tetrakis(pentafluorophenyl)borate or potassium tetrakis(pentafluorophenyl)borate is solvent-wet, and wherein said liquid dihydrocarbyl ether is diethyl ether.

32. A process according to Claim 30 wherein the acid is in aqueous solution.

33. A process according to Claim 30 wherein the acid is in diethyl ether.

34. A process according to Claim 1 wherein said magnesium di[tetrakis(<sup>F</sup>aryl)borate] is magnesium di[tetrakis(pentafluorophenyl)borate], wherein the amine is phenyl(dimethyl)amine, wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers, wherein said liquid dihydrocarbyl ether is diethyl ether, and wherein the protic acid is hydrochloric acid, hydrobromic acid, or hydroiodic acid.

35. A process according to Claim 34 wherein the acid is in aqueous solution.

36. A process according to Claim 34 wherein the acid is in diethyl ether.

37. A process according to Claim 1 wherein said halomagnesium tetrakis(<sup>F</sup>aryl)borate is bromomagnesium tetrakis(pentafluorophenyl)borate, wherein the amine is phenyl(dimethyl)amine, wherein the liquid organic medium comprises one or more liquid

dihydrocarbyl ethers, wherein said liquid dihydrocarbyl ether is diethyl ether, and wherein the protic acid is hydrochloric acid, hydrobromic acid, or hydriodic acid.

38. A process according to Claim 37 wherein the acid is in aqueous solution.

39. A process according to Claim 37 wherein the acid is in diethyl ether.

40. A process according to Claim 1 further comprising distillation of the liquid organic medium in at least one boiling hydrocarbon.

41. A process according to Claim 40 wherein said boiling hydrocarbon is a mixture of at least one saturated hydrocarbon and at least one aromatic hydrocarbon.

42. A process according to Claim 41 wherein said aromatic hydrocarbon is toluene.

43. A process according to Claim 41 wherein said saturated hydrocarbon is Isopar-E.

44. A process according to Claim 40 wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers.

45. A process according to Claim 41 wherein said protic ammonium tetrakis(<sup>F</sup>aryl)borate is not hydrocarbon-soluble, and wherein said protic ammonium tetrakis(<sup>F</sup>aryl)borate is precipitated.

46. A process according to Claim 41 wherein said protic ammonium tetrakis(<sup>F</sup>aryl)borate is hydrocarbon-soluble, and wherein said protic ammonium tetrakis(<sup>F</sup>aryl)borate is recovered in solution.

47. A process according to Claim 1 wherein at least a portion of the solution of protic ammonium tetrakis(aryl)borate in the liquid organic medium is separated from the aqueous phase.

48. A process according to Claim 47 wherein at least a portion of the protic ammonium tetrakis(aryl)borate is isolated from said solution of protic ammonium tetrakis(aryl)borate in the liquid organic medium.

49. A process according to Claim 40 wherein said boiling hydrocarbon is a mixture of at least one saturated hydrocarbon and at least one aromatic hydrocarbon, wherein said aromatic hydrocarbon is toluene, and wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers.

50. A process according to Claim 49 wherein said saturated hydrocarbon is Isopar-E.

51. A process according to Claim 1 further comprising forming a liquid clathrate with the protic ammonium tetrakis(<sup>F</sup>aryl)borate.

52. A process according to Claim 51 wherein toluene is used in forming the liquid clathrate.



53. A process according to Claim 51 wherein said protic ammonium tetrakis(<sup>F</sup>aryl)borate is phenyl(diethyl)ammonium tetrakis(pentafluorophenyl)borate.

54. A process for producing at least one protic ammonium tetrakis(<sup>F</sup>aryl)borate, which process comprises

- i) mixing together (a) a mixture comprising a liquid organic medium and at least one halomagnesium tetrakis(<sup>F</sup>aryl)borate, wherein the liquid organic medium is comprised of one or more liquid dihydrocarbyl ethers, one or more liquid hydrocarbons, one or more liquid halogenated hydrocarbons, or a mixture of two or more of the foregoing, and (b) at least one amine, wherein the amine has the formula  $R_3N$ , in which each R is independently a hydrocarbyl group containing up to about thirty carbon atoms, to form a solution or slurry; and
- ii) mixing together at least one protic acid with at least a portion of the solution or slurry formed in i), such that a protic ammonium tetrakis(<sup>F</sup>aryl)borate is formed, wherein each of the <sup>F</sup>aryl groups is a fluorine-containing aryl group that has bonded directly to an aromatic ring at least two fluorine atoms, or at least two perfluorohydrocarbyl groups, or at least one fluorine atom and at least one perfluorohydrocarbyl group.

55. A process according to Claim 54 wherein said halomagnesium tetrakis(<sup>F</sup>aryl)borate is bromomagnesium tetrakis(pentafluorophenyl)borate.

56. A process according to Claim 54 wherein said halomagnesium tetrakis(<sup>F</sup>aryl)borate is bromomagnesium tetrakis(pentafluorophenyl)borate, wherein the amine is phenyl(dimethyl)amine, and wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers.

57. A process according to Claim 56 wherein said liquid dihydrocarbyl ether is diethyl ether.

58. A process according to Claim 54 wherein said protic acid is hydrochloric acid, hydrobromic acid, or hydriodic acid.

59. A process according to Claim 54 wherein said halomagnesium tetrakis(<sup>F</sup>aryl)borate is bromomagnesium tetrakis(pentafluorophenyl)borate, wherein the amine is phenyl(dimethyl)amine, wherein the liquid organic medium comprises one or more liquid dihydrocarbyl ethers, wherein said liquid dihydrocarbyl ether is diethyl ether, and wherein the protic acid is hydrochloric acid, hydrobromic acid, or hydriodic acid.

60. A process according to Claim 59 wherein the acid is in aqueous solution.
61. A process according to Claim 59 wherein the acid is in diethyl ether.